JPRS 75537
21 April 1980

Worldwide Report

NUCLEAR DEVELOPMENT AND PROLIFERATION

No. 39

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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FRG TO SELL NUCLEAR REACTOR TO ARGENTINA

OW290937 Beijing XINHUA in English 0926 GMT 29 Mar 80 OW

[Text] Buenos Aires, 28 Mar (XINHUA)--West Germany will provide Argentina with a nuclear reactor and equipment, materials and technology concerned under an agreement reached between the two countries, the presidential office announced yesterday.

The nuclear reactor will be installed at the "Atucha II" central power station.

The announcement said that this was a "satisfactory agreement." It was signed during the recent visit to the country by the West German delegation led by Secretary of State of the Ministry for Economic Cooperation Per Fischer.

Earlier, the U.S. Government objected to West Germany selling nuclear reactors to Argentina under the pretext that Argentina had refused to sign the nuclear non-proliferation treaty.

Argentina has been sparing no effort in achieving independence in this field and has made steady progress in the utilization of nuclear energy. It has now become one of the advanced countries in this field in Latin America.

CSO: 4020

USSR, FINLAND SIGN WIDE-RANGING NUCLEAR POWER PACT

Helsinki HELSINGIN SANOMAT in Finnish 1 Mar 80 p 27

[Article: "Finland and USSR Have Several Joint Nuclear Power Projects"]

[Text] Finland and the Soviet Union are contemplating several economically important joint ventures in the use of nuclear power.

Negotiations have been conducted on the participation of Finnish firms in the instrumentation of a 1,000-megawatt nuclear power plant to be built in the Soviet Union. Also trade negotiations on the joint construction of a nuclear power plant in Libya have already progressed rather well.

Energy cooperation was the subject of a meeting of the energy work group of the Joint Economic Commission, which concluded on Friday in Helsinki. Section Chief Erkki Vaara of the Ministry of Trade and Industry acted as chairman of the work group. The Soviet delegation was headed by Deputy Minister N. Lopatin of the Soviet Ministry of Energy.

At the meeting of the energy work group it was confirmed that Imatra Power and the Soviet organization Atomenergoexport are trying to reach an agreement during the current year on the compilation of an adaptability report for a 1,000-megawatt nuclear power plant intended for Loviisa.

"The Soviet Union is prepared to accelerate its own work so that the Finnish side can for its part resolve this issue," stated Lopatin.

The making of an adaptability report does not yet necessarily mean that a nuclear power plant will be ordered, was the statement from Imatra Power. The explanatory work, however, must be initiated so that Imatra Power will be able to make a decision in 1982 with regard to ordering a Soviet power plant.

Vaara as well as Lopatin emphasized the concrete nature of this cooperation at a press conference. Even though the energy group does not conclude agreements, the goal is to create a framework in which fruitful cooperation can be developed at the enterprise level.

Imatra Power, in particular, which owns the power plant at Loviisa, has been developing nuclear power cooperation. The Finnatom group, which was formed by industry, and Nokia have also been actively involved in this work.

Special Attention to Energy Conservation

In the discussions special attention was given to questions of energy conservation, and both parties considered that there are especially good opportunities for developing trade and economic cooperation in energy conservation questions concerning the use of energy for industry and construction, energy production, and social planning, as was confirmed at the press conference.

For the first time a quota on machinery and equipment deliveries with respect to energy conservation was noted in the five-year trade agreement beginning next year. It is intended to provide a more precise definition of the points of cooperation at a meeting of experts to take place in Moscow in May.

According to Vaara there was also a general discussion on natural gas imports at the meeting. According to him Finland was not yet ready to enter into a detailed discussion of the question concerning increased natural gas imports.

Cooperation in the construction of conventional thermal power plants was also discussed in connection with this meeting. At this time there was an explanation of possibilities for delivering to Finland 30/60-megawatt turbines for remote thermal power plants and 100-200-megawatt turbines for condensed liquid power plants.

It is expected that cooperation in the construction of conventional power plants will also be extended to third party countries. For example, 100-200 megawatt turbines, which were the subject of an explanatory report, can also be used in peat power plants.

It was considered important in the preparation of hydroturbines to study the possibility of augmenting the production of Soviet hydroturbines with Finnish hydropower machinery while keeping the markets of third party countries in mind.

The next joint meeting of the energy work group will be held in the fourth quarter of this year in the Soviet Union.

10576
CSO: 5500

QUEENSLAND PREMIER BIDS FOR FIRST URANIUM PLANT

'Sales' Talks Abroad

Canberra THE AUSTRALIAN in English 19 Feb 80 p 1

[Report from Alan Goodall in Tokyo]

[Text] AUSTRALIA's first uranium enrichment plant will be built within five years, possibly near Townsville, if the Queensland Premier, Mr Bjelke-Petersen, succeeds in an overseas "sales" mission.

Mr Bjelke-Petersen has started talks in Tokyo to site a uranium processing plant on the north Queensland coast.

He used the same "sales pitch" to a European consortium, Urenco-Centec, in London at the weekend.

The Premier described the talks as "very satisfactory" and said the consortium would be sending a technical team to Australia to look into the building of enrichment plant equipment.

The State inister for Mines, Mr Camm, has finished negotiations with the French Atomic Energy Commission and has flown from Queensland to join Mr Bjelke-Petersen for the Tokyo talks.

Mr Camm said the commission would also be sending experts to Australia.

He said the French were keen to process Australian yellowcake.

Mr Bjelke-Petersen meets the Japanese Prime Minister, Mr Ohira, today before talking with Japanese industrialists and bankers.

Before opening a plush new Queensland government office in Tokyo – furnished at a cost of more than $500,000 – he said he would welcome Japanese equity in a uranium plant and the opening up of new Queensland steaming-coal mines.

Mr Bjelke-Petersen said: "Queensland sells yellowcake and we are willing to sell enriched uranium.

"We've always said we are willing uranium sellers, so why not get the full benefit by selling the enriched product?" he said.

Queensland government technical staff in Tokyo said that while Australia's only productive mine – Mary Kathleen in north-west Queensland – was producing only 800 tonnes of yellowcake a year, the big exports would come from Northern Territory giants, Ranger and Narbelek.

A staff spokesman said: "Choice of processing technology will take some time, but there is no reason why a plant could not be built within five years."

Mr Bjelke-Petersen and Mr Camm will also urge Japan, during their week-long Tokyo visit, to invest in Queensland coal mines.

Mr Camm said: "We will not insist on the Federal Government's 50 per cent foreign investment guideline.

"To develop mines for the steaming coal Japan wants, we have a flexible policy, particularly in the development stage when it is hard to get enough Australian capital," he said.

Remarks on Return

Brisbane THE COURIER-MAIL in English 28 Feb 80 p 8

[Text]

REFUSAL by Australia to export uranium to an energy-starved world could lead to other nations trying to take it by force, the Premier, Mr Bjelke-Petersen, said yesterday.

"We've got the uranium and we can't withhold it from the free world," he said.

"You generate hostility if you deny to the rest of the world something that you have in abundance."

Mr Bjelke-Petersen spoke at a press conference following his return from an overseas trip during which he officially opened the State Government's office in Tokyo.

Mr Bjelke-Petersen disclosed that the office cost $400,000.

But this was only a tiny fraction of the $1200 million which Queensland earned from Japanese trade each year, he said.

The offices were first-class and were in one of Tokyo's top business areas.

The Premier said France, Holland, West Germany and Japan had shown interest in acquiring uranium and the establishment of a uranium enrichment plant in Queensland.

There also was strong interest, particularly by Japan, in Queensland's steaming and coking coal.

Mr Bjelke-Petersen said two groups of Japanese businessmen would visit Queensland next month to examine coal propositions.

He said if Australians thought they could get away with not exporting uranium, they should consider what would occur if Middle East countries stopped exporting oil.

"Would people freeze and starve without doing anything about it?

"If we don't allow it (uranium) to be exported then we face the prospect of its being taken by force."

Mr Bjelke-Petersen said he had told overseas interests that Queensland would not build a uranium enrichment plant near Townsville.

There were numerous isolated areas which could be utilised, although this was not necessary.

"We've had uranium for 30 years without a catastrophe," Mr Bjelke-Petersen said. "In that time hundreds of men have died in coal mine accidents."

He said top uranium experts had indicated that it was perfectly safe to mine and utilise uranium.

CSO: 5100

NUCLEAR TEST SITE MANAGEMENT COSTS GOVERNMENT $1 MILLION

Canberra THE AUSTRALIAN in English 21 Feb 80 p 11

[Text]

THE Federal Government has spent more than $1 million on the management of former British nuclear test sites in Australia over the past three years.

The expenditure included surveillance and radiological surveys of the three former test sites at Monte Bello Island off Western Australia, and Maralinga and Emu in South Australia.

It also included returning half a kilogram of plutonium from the Maralinga site to Britain early last year.

In reply to a question on notice from the Opposition Whip in the House of Representatives, Mr Leslie Johnson, the Minister for National Development and Energy, Senator Carrick, said the clearance and rehabilitation of the Rum Jungle mining area in the Northern Territory cost $300,000 in 1977-78.

Expenditure on the management of Monte Bello, Emu and Maralinga had been $74,000 in 1976-77, $358,000 in 1977-78 and $631,000 in the last financial year.

Senator Carrick said the Government had recently sought the co-operation of the States to develop co-ordinated nuclear waste management policies.

He said safe storage of radioactive waste at atomic test sites was provided by shallow ground burials.

Burial of long-lived radioactive waste at the sites was secured by concrete capping.

Waste from medical, industrial and research use of radioactive isotopes was held in shielded storage facilities pending decay to levels enabling safe disposal.

CSO: 5100

OPPOSITION SPOKES[illegible] SCORES ATOMIC ENERGY ACT

Sydney THE SYDNEY MORNING HERALD in English 27 Feb 80 p 13

[Text]

The Atomic Energy Act was irrelevant and out of date and the Opposition would not support future amendments to it, Labor's minerals and energy spokesman, Mr Keating, said yesterday.

Labor would support the amendments now before Parliament, he said, but even these did not go far enough.

Unnecessarily repressive and secretive penal provisions still remained, which represented a serious threat to the civil rights of Australians.

Mr Keating was replying to the second reading of the Atomic Energy Amendment Bill (No 2), which provides that Commonwealth authority to mine uranium will be subject to State Government consent unless authority was being given only for defence purposes.

The bill also seeks to remove two penal provisions of the Act, which said that no action could be taken against the Commonwealth in the event of unlawful arrest, detention, search or seizure, and that the "doing of an act" before an offence was itself an offence.

Mr Keating said Labor supported these amendments, but he submitted a Labor amendment seeking withdrawal and redrafting of the bill.

The Labor amendment said the Atomic Energy Act was an inappropriate legislative basis for nuclear energy research and development and for commercial acivities.

It said new legislation should be drafted to establish:

An independent regulatory authority responsible for nuclear-related environmental protection, health, safety and security.

A Government corporation to conduct the present commercial activities of the Atomic Energy Commission.

A nuclear science authority to perform the other functions now undertaken by the commission.

Mr Keating said the Government had been forced to make numerous piecemeal amendments in an attempt to make the Atomic Energy Act, introduced in 1953, relevant. But this had failed.

Some penal provision remained in the Act under which a person could be prosecuted for various offences "without necessarily showing that he was guilty of a particular act."

Section 30 provided that a person reasonably suspected of having committed or having attempted to commit an offence against other sections of the Act could be detained, searched and arrested without a warrant.

Debate on the amendments was gagged by the Government and they were defeated on party lines before the bill passed all stages.

CSO: 5100

BRIEFS

CYLINDER LOSS DENIED--Sydney.--A story in 'The Age' yesterday about a missing cylinder of radioactive material was "alarmist", an Atomic Energy Commission spokesman said yesterday. He said the transportation of radioactive material in Sydney was governed by strict rules which ensured complete safety. The story reported a wide police search for a cylinder of radioactive material which was reported missing on Saturday, between Sydney airport and the commission's reactor at Lucas Heights. It pointed out that the cylinder was in fact not missing. [Text] [Melbourne THE AGE in English 19 Feb 80 p 3]

SOUTH AUSTRALIAN PLANS--The South Australian Government will consider taking an equity in the State's prospective uranium conversion and enrichment industry. The SA Minister of Mines and Energy, Mr. Goldsworthy, told the SA Parliament last night Government equity would ensure that any future concern over choice of customers or customer performance would be reflected in sales contracts and conditions. Mr. Goldsworthy appears to be saying the SA Government will vet contracts and customers, duplicating the controls held already by his federal colleagues. Conversion and enrichment of uranium had special appeal to South Australia, he said. [Text] [Melbourne THE AGE in English 21 Feb 80 p 22]

CSO: 5100

ROK TO BUILD URANIUM EXTRACTION PLANT NEXT YEAR

Tokyo THE TONG-IL ILBO in Japanese 17 Jan 80 p 2

[Text] On the 14th, the government disclosed the plan to complete by next year the construction of a uranium extraction plants which uses as a raw material approximately 2 million tons of rock phosphate yearly imported by three domestic compound fertilizer factories beginning with Yongnam Chemical so that 440,000 pounds per year of uranium will be produced for supplying nuclear fuels usable at the three nuclear power plants. The plant to be constructed uses the uranium extraction process developed by the Korean Institute of Science and Technology (KIST), and will be charged with a mission to produce highly purified preconcentration stage uranium of a 98 percent yellow cake (U 308) from rock phosphate.

It was in June 1978 that the KIST succeeded in extracting uranium from rock phosphate imported as a chemical raw material by the three companies, Yongnam Chemical, Chinhae Chemical and Nanhae Chemical. By the joint venture of KIST and Yongnam Chemical, a test uranium extraction plant was built and the test operation was run for approximately one year. Uranium usable in nuclear power plants, as a raw material, has been produced since July last year at a production rate of 7,000 to 20,000 pounds per year at a high purity of 98 percent.

All the secondary raw materials and essential equipment required in the plant are produced, manufactured or designed in Korea. The extraction medium, the most important of all, is developed, manufactured and supplied by KIST.

Also, this plant is managed under an unique arrangement whereby KIST took the responsibility for the design and the construction which Yongnam Chemical is in charge of operation. It is regarded as an exemplary academic and industrial partnership.

Rock phosphate imported by the three major compound fertilizer factories, Yongnam Chemical, Chinhae Chemical and Namhae Chemican, amounts to approximately 2 million tons per year. The majority of the import is from Florida, U.S.A., and is considered a promising uranium source because of its 190ppm uranium content.

When all of these three factories get a uranium extraction plant constructed, 440,000 pounds per year of uranium can be domestically supplied, which is a quantity more than adequate to accommodate the amount required for No 1, No 2 and No 3 nuclear power plant units.

When trying to use this uranium as nuclear fuel, every country sends it to isotope concentration plants in the U.S. to be finished through complicated processes. However, the high quality of the uranium produced by Yongnam Chemical makes it possible to exclude considerably the concentration processes provided in the U.S.

8940
CSO: 5100

NUCLEAR DEVELOPMENT CALLED 'SLEEPING GIANT'

Mexico City EL SOL DE MEXICO in Spanish 20 Mar 80 pp 1-B, 2-B

[Article by Arturo de Aquino: "Nothing Being Done in Uranium Areas"]

[Text] The nuclear sector, a giant with the same or greater strategic importance than oil, is inconceivably still "asleep" in Mexico, in spite of the fact that vast areas with uranium have already been located in different parts of the country and that it is confronted by an enormous challenge to overcome: the establishment of 20 nuclear plants before the year 2000.

A whole apparatus has already been set up around the nuclear industry. The ININ [National Nuclear Research Institute], URAMEX [expansion unknown; probably Mexican Uranium Corporation] and safeguard commissions have been in existence for several years now, under various names, but the truth is they have done little or almost nothing. The steps taken up to now within this field are the same ones taken in the past.

Even installation of the first nucleoelectric powerplant in the country, the one at Laguna Verde, has left nothing for Mexican technology. The French installed it and left it operating, without anyone in Mexico learning anything with regard to its function.

These aspects are derived from comments obtained by EL SOL DE MEXICO made by people connected in one way or another with the nuclear industry, like Dr Dalmau Costa, director of ININ; Engineer Estelio Baltazar Cadena, director of ESIQUIE; Antonio Ponce, secretary of the ININ union and URAMEX itself.

According to data provided by the director URAMEX, Dr Francisco Vizcaino Murray, Mexico has 8,800 metric tons of uranium as proved reserves. As probable reserves, it has 32,800, and as potential reserves, 225,000 metric tons.

Nevertheless, Engineer Baltazar Cadena stated that "the reserve evaluation policy has not been very sound, because, without economic resources, it is impossible to leap forward as Dr Vizcaino Murray announces."

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CSO: 5100

BRIEFS

NUCLEAR POWER, URANIUM ENRICHMENT--Yesterday's budget includes record allocations from nuclear power, uranium enrichment, and oil exploration. For nuclear power, the allocation to the Atomic Energy Research Foundation [Atoomkrag-navorsingsfonds] is increased from R26,625,000 to R50,610,800, while the amount for administration of the Atomic Energy Board r'ses from R5,599,400 to R6,224,900. For uranium enrichment, R142,300,000 is set aside, compared to R99,895,000 for last year. The allocation to Soekor, which is responsible for oil exploration, increases from R37,800,000 to R73,914,000. [Text] [Capetown DIE BURGER in Afrikaans 27 Mar 80 p 10]

CSO: 5100

NUCLEAR POWER FIRM TO STORE WASTES IN COUNTRY

Helsinki UUSI SUOMI in Finnish 1 Mar 80 p 19

[Article: "Preparations Must Be Made for Storage of Nuclear Waste"]

[Text] Teollisuuden Voima [Industrial Power] must make preparations to store its used fuel perhaps for even a long time since the possibilities for the retreatment of fuel are especially limited in the world and there will not be an overabundance of commercial agreements.

This was the evaluation of Professor Pekka Silvennoinen of the State Technical Research Institute's laboratory for nuclear power engineering. He has participated in a 3-year international study sponsored by INFCE. The study concerned the circulation of nuclear fuel, and 50 market economy countries participated in it.

The reactor in Teollisuuden Voima's nuclear power plant produces approximately 18-19 tons of used fuel annually. The world's present treatment capacity corresponds to 1,000 tons of uranium oxide annually.

The reactors constructed by Imatra Power produce approximately 13 tons of used fuel each every year. On the basis of an agreement concluded with the Soviet Union, from where the raw material also comes for the reactors, the used fuel from Loviisa is taken to the Soviet Union.

Uranium From Many Sources

In Silvennoinen's opinion the supporters of retreatment and the use of plutonium do not have reliable information about the price formation of plutonium.

It is also uncertain when the price of plutonium will approach its theoretical physical value.

"As far as the rehabilitation of fuel from Loviisa is concerned a market base is lacking from applicable payment arrangements. The uncertainty of the price of plutonium makes it understandable that Industrial Power rejected a recent retreatment offer from England, which concern only a limited amount," noted Professor Silvennoinen.

He proposes that in the future Finland should guarantee its procurement of uranium from as many sources as possible. This for its part is a result of the fact that the health and environmental risks of the mining of uranium being greater than, for example, the final depositing of waste it cannot be expected that the negative reactions of the public in uranium producing countries with respect to accepting used fuel will decline.

Wastes to Be Deposited in Finland

On the basis of public reaction Professor Silvennoinen has come to the conclusion that the final storage of wastes in Finland is an alternative with which we must live for the time being.

However, Industrial Power has the conditions for reaching an agreement with its supplier of crude uranium, Canada, so that the waste from the concentrate will remain in the Soviet Union. Thus we would avoid the difficult storage of weak uranium in Olkiluoto.

As his personal opinion Professor Silvennoinen proposes the storage of waste from nuclear fuel in granite foundation rock. In Sweden such storage is planned for approximately a depth of 0.5 kilometers. In Canada plutonium is stored at a depth of 0.5-1.5 kilometers.

10576
CSO: 5500

FLOATING NUCLEAR PLANTS PROPOSED FOR NATIONAL ENERGY PLAN

Rome NOTIZIARIO CNEN in Italian Jan 80 pp 17-22

[Article by B. Guerrini, L. Guidi, R. Lepore, P. Masoni, M. Mazzini, University of Studies at Pisa, School of Engineering, Nuclear Plant Institute]

[Text] Fuel oil, coal and uranium are the principal sources from which we could extract a great part of the electricity needed for the next two or three decades. The other sources, still within this period, could provide only an auxiliary contribution, if not a marginal addition.

The situation with regard to fuel oil is well known: constantly less availability at constantly increasing prices.

On the other hand, the situation with regard to coal is less well known. One single powerplant of the Porto Tolle or Tor Valdaliga type (four 660-megawatt electric generator sets, equivalent to two 1,200-megawatt electric net nuclear generator sets), if it operates with 65 percent utilization coefficient, that is to say for almost 6,000 equivalent hours of full load, it produces around $15 \cdot 10^9$ kWh/a and consumes $5 \cdot 10^6$ metric tons of coal in the same period. Italy does not have the infrastructure for unloading that much coal (100 colliers each with a 50,000-metric-ton capacity a year) in the vicinity of each plant and for transporting it, then, to the storage area of the powerplants.

Added to this is the fact that, in the recent past, powerplants fired with fuel oil have undergone delays and shutdowns for years by the opposition of local communities to the use of oil itself regarded as polluting. The request was, and is, to burn methane or, at most, oil with a low sulfur content, much in demand and therefore not easy to find.

It is impossible to see through what mechanism the same or similar communities can be convinced successfully to accept the use of coal, certainly more polluting than fuel oil and whose problems (emission of dust and gas, disposal of ashes, and so on) are not solved satisfactorily at present and will not be solved, at least on an industrial scale, in the period involved. Among other things, in Italy only the use of coal with a sulfur content of less than 1 percent, rather rare, is allowed (1).

Aversion to recourse to nuclear energy has, in fact, caused a standstill in construction of nuclear powerplants in Italy. In the last 15 years, and that is many years, only one unit of the Caorso powerplant has been constructed and only recently construction was started on two units of the Alto Lazio powerplant. The remaining powerplants scheduled in the program, even though small in number, are still on paper.

At this point, we are right in asking ourselves what can happen. The most likely assumption is that the situation will not change and that the nation's electricity system will continue to move toward a progressive shortage of available power and, therefore, toward a constantly greater limitation imposed on consumer goods.

If that happens, as, unfortunately, seems very likely, in spite of the conservation programs that are, however, necessary, within a decade, electricity will have to be rationed not only for private uses, but also for industrial purposes, with very serious economic and social consequences.

In view of the obviousness and the dramatic nature of the crisis that will be inflicted on employment, at that point a technical solution of some kind or other will be sought that public opinion and political circles will be ready, in their great majority, to accept, setting aside so many perplexities, not always justified moreover. But this kind of solution will not be available in the short term. Construction of an electric powerplant, regardless of the type, requires many years, too many for the urgency of the moment.

It is the duty of the technicians to submit options that should be evaluated, then, in the appropriate political centers. The one presented here is precisely the technical option to be studied now for that time. It is a question of being equipped to build, near shipyards and therefore of beginning construction as soon as possible, nuclear electric powerplants on floating platforms to be towed completely for installation in artificial basins dug on coastal sites and connected with the sea.

General Remarks

Construction of floating nuclear plants (FNP) was considered in the United States in the second half of the 1960's, when the first studies were made with regard to design.

Owing to the increased difficulty encountered in some densely populated areas of the United States in finding land sites reasonably close to consumption centers, owing to an improvement in the quality level of construction by means of their complete construction in specialized shipyards and, finally, owing to greater ease in obtaining permits by means of a very high degree of standardization of the plants, studies in depth were made only later (1971), however, to determine the actual technical and economic feasibility of the proposed solution.

The positive result of these studies led, in 1972, to the establishment of a joint company between Westinghouse and Tenneco (Tenneco withdrew subsequently), called Offshore Power System (OPS), for construction of floating plants (2).

Studies were started recently, in the USSR, on the possibility of installing fast reactors on floating platforms at 5 to 10 kilometers off the coast (3).

The locations proposed for the FNP are (4):

Offshore, plant moored several kilometers from the coast, protected by a breakwater.

Onshore, in artificial basins on the coast.

Nearshore, close to the coast or to islands, to allow access directly from the mainland.

In inland waters.

The floating state offers a number of advantages owing substantially to the partial freedom of the plant from the site. The following stems from that:

a. The possibility, at least in principle, of the mass construction of standardized plants, taking as reference a site offering predetermined characteristics, so that the standardized plant can be placed in every site whose characteristics are included in the the characteristics of the reference site (for plants located on land, specific technical requirements connected with soil features greatly restrict application of this principle.

b. The possibility of separating, first with regard to design and then legally, the construction permit for components and the entire plant from approval of the site (on the other hand, a close connection between plant design and chosen site makes this procedure practically impossible for plants on land).

c. A substantial reduction in seismic effects on the plant, owing to the presence of the water cushion under the platform.

d. Ease in dismantling the plant at the end of its operational life, because it can be transported to an appropriate shipyard where there are excellent facilities for performing the work.

In short, floating plants facilitate solution of some technical problems limiting the number of available sites, especially in Italy. But the problems of location are not only technical. Up to now, it has been practically impossible to apply the authorization practice specified by Law 393, of 2 August 1975, with regard to prescribed times. This Law 393 specifies, in fact, two and a half years for qualification and approval of a site.

Actually, in the best of cases, delays lead to a doubling of this time. Installation of nuclear electric powerplants on floating platforms provided for in the National Energy Plan could make possible a technical examination by the CNEN [National Nuclear Energy Commission] and by the agencies concerned and the granting of a construction permit independently of actions for final location.

Execution of work for preparing the site for plants on land generally requires less time than is needed for offshore plants, but probably more time than is needed for onshore plants.

In view of design standardization and of the possibility of constructing and testing in the building yard, it is reasonably possible to believe that the construction time of a floating nuclear plant is reduced by about 1 year in comparison with the time needed for building a similar plant on land.

If the smaller financial burdens of builders and the saving resulting from construction and partial testing in the building yard and shop are taken in account, it seems reasonable to assume at least a 5-percent reduction in total cost.

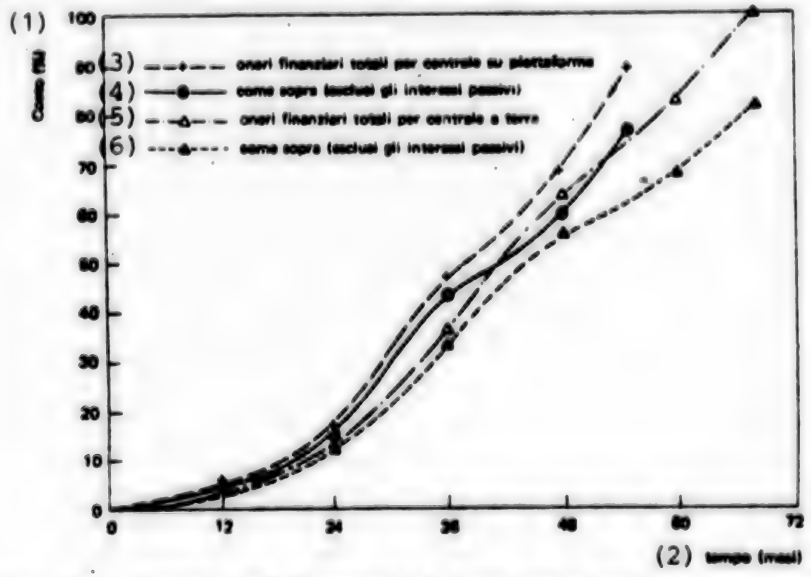

Fig. 1: Trends of financial burdens during construction. Key: 1. cost (%); 2. time (months); 3. total financial burdens for powerplant on platforms; 4. same as above (excluding interest paid); 5. total financial burdens for powerplant on land; 6. same as above (excluding interest paid)

It is seen, from an examination of figure 1 in which a plausible trend of annual investments in both cases and the total costs sustained, using 100 for the total cost of a plant on land, is reported, that the interest paid decreases to an extent equal to over 6 percent of the cost of the plant. Therefore, the total saving can be estimated at around 11 percent.

In comparison with the advantages mentioned so far, construction of plants on floating platforms raises technical problems that certainly are complex but capable of solution by using the technological skills available at present.

Some problems, of a general nature, are independent of the type of location, including, for example:

Arrangement of transportation of the platform from the construction yard to the site by sea.

Protection of the platform from corrosion.

Platform motion.

Possibility of sinking (of support on the bottom, in the case of shallow depths).

On the other hand, other problems are characteristic of the particular location chosen. The two main alternatives -- offshore and onshore -- will be discussed briefly below. Nearshore locations and in inland waters present problems similar to offshore and onshore locations, but conditions for actual possibility of installation can be found much more rarely.

Comparison Between Offshore and Onshore Locations

Location of a nuclear plant at sea a few kilometers off the coast (offshore) involves, in addition to the general problems already indicated, the need for construction of a dike for the purpose of keeping the water calm inside the basin and of protecting the plant from natural events (for example storms, tsunamis (waves caused by a distant earthquake (5)), and from collisions with ships. It also gives rise to obvious interference with navigation and fishing.

Other problems not negligible in importance are raised by the transmission of electricity from the platform to a station on land by means of underwater cables, and by arrangements for linkage with the mainland for transporting personnel and supplies, especially complicated during construction.

In addition, extensive oceanographic research is required for determining design conditions, together with other typical research work for selection of the site for nuclear plants on land.

The specific advantages of this kind of location may be singled out primarily in the following:

a. Ample availability of water for cooling the condenser (a factor that can limit severely selection of sites on land.

b. Possibility of building the plant in the vicinity of consumption centers, because an area of exclusion with a radius of several kilometers is guaranteed automatically. That can make it possible to locate the plant even in areas facing coastal regions characterized by a high density of population, located near large consumption centers.

Location of the plant in an artificial basin protected by the beach (onshore) presents the advantage of not requiring a massive protection structure, underwater transmission cables, a service of ships and other craft to and from the plant during its construction and operation.

The design and types of structure to be used for constructing the basin are determined by local geology and by the specific conditions of the site.

The plant is protected naturally from natural events like storms and tsunamis and from the risk of collisions with ships. This natural protection can be increased by locating the plant itself behind sand dunes, islands or shoals.

Qualification of suitable sites for this type of location requires development of studies and research needed for selecting a site for a nuclear plant on land on the coast. On the other hand, there is no need for specific studies of an oceanographic nature, which, as has been said, are needed, however, for offshore location.

It must also be pointed out that installation of the powerplant in an artificial basis minimizes, from the point of view of economy, impact on the environment (6).

The site on the beach must also be rather close to deep water to make easy construction of an access for the plant and to avoid excessively long water intake and discharge conduits. The material to be removed must be dredgeable or at least easily removable by means of normal machinery, in order to keep pertinent time and costs within acceptable limits (4).

It must be observed, however, that with the onshore location, certain specific advantages of the offshore location are reduced appreciably, particularly with regard to the one illustrated in point b, above.

On the basis of the above-mentioned remarks, it seems preferable to adopt the onshore solution for the near future, in Italy, because it involves less than the other location possibilities offered by floating plants. With this solution, it is also possible to use coastal sites already singled out. When the problem of finding sites really becomes more urgent, recourse may be had to the offshore solution, for which the experience obtained with the installation of onshore plants will be valuable.

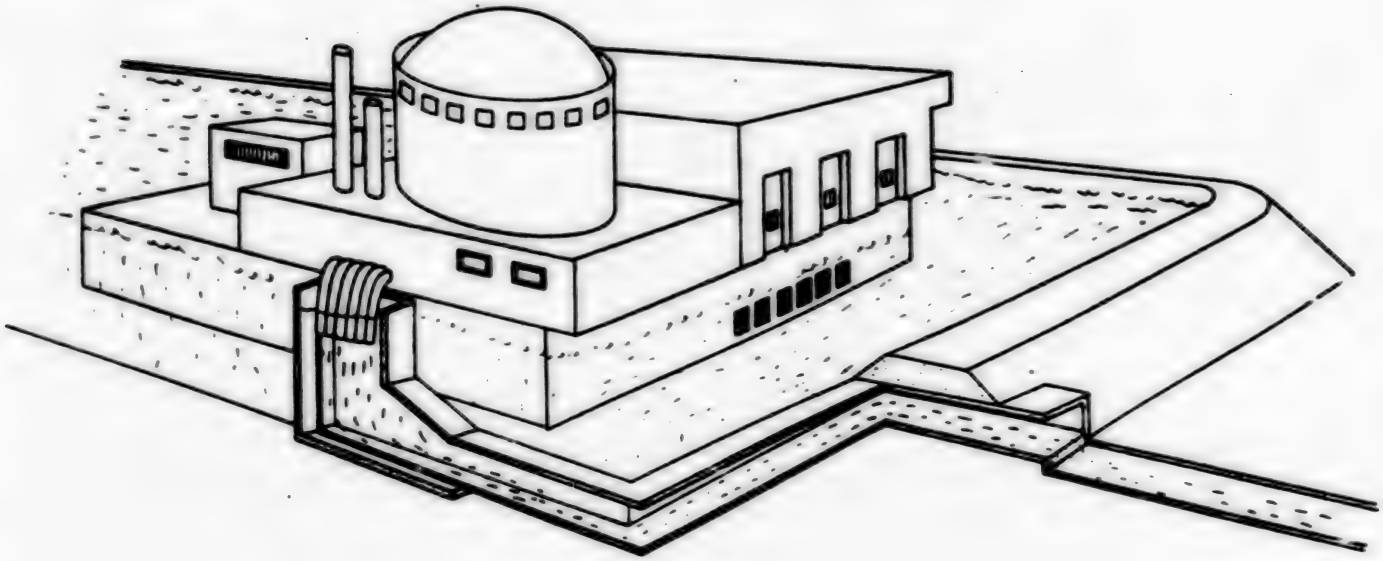

Fig. 2: Proposed sketch of a nuclear electric powerplant on a floating platform

The Proposed Solution

A correct, adequate solution to the numerous problems connected with building nuclear plants on floating platform clearly requires a concentration of the efforts of Italian industry operating in the nuclear sector.

This requirement would, in any case, be of primary importance, in order to be able to aspire reasonably to the attainment of considerable autonomy in high technology sectors like the nuclear sector.

It seems reasonable to believe that this objective, of primary importance for effective participation by the nation's industries in developing nuclear activities, can be attained in acceptable time limits, when account is taken of the statements by the heads of various agencies, also reported by the specialized press, from which an opportunity seems to emerge constantly more frequently to give life to an industrial monostructure that will unite public participation enterprises with private enterprises.

At any rate, it is obvious that, independently of the good will and of the conviction of enterprises, only a rapid start of the nuclear electric powerplant construction program, already approved by Parliament, can give actual concrete shape to this kind of initiatives.

With this prospect, an initial broadly general analysis has been made pertaining to the construction of an onshore powerplant, equipped with two PWR [Pressurized Water Reactor] reactors (7). Its arrangement on two platforms moored inside a basin located at about 200 meters from the shoreline, connected with the sea, has been assumed.

The depth of the basin must be such that, under conditions of low tide and maximum inclination of the platform, it will not come in contact with the bottom. A depth of about 13 meters is regarded as sufficient.

The basin walls must be adequately sloped and stabilized, so that they will retain their structural integrity under stresses caused by the most severe conditions that can be assumed for the site, including earthquakes and floods (Design Basis Conditions).

Each platform is connected to three reinforced concrete mooring structures, located along the basin walls.

The basin is rectangular in shape with approximate dimensions of 270 meters by 150 meters, the minimum compatible with motion of the platform (115 meters by 122 meters in size), the dimensions of the mooring system and the slope of the walls, so that there is no possibility of contact between the platform and adjacent structures.

The basin can be surrounded by a protective embankment to shield the plant from extreme natural events (floods, and so on).

Access to the plant is obtained by means of a wharf connecting the protective embankment with the platform, capable of adjusting to shifts of the platform.

Provision is made for excavating the basin and the access channel while dry by first constructing two independent plastic diaphragms. The channel for access to the platform will be not much over 115 meters wide and about 10 meters deep (the platform draws 9.5 meters).

The channel can be closed off seawards by means of prefabricated self-sinking caissons or with structures that will facilitate eventual reopening, if that is believed advisable in the future (for example, in order to dismantle the plants). These structures permit free passage of water drawn from the bottom and, at the same time, protect the channel and, therefore, the basin from the wavy motion of the sea.

After the platforms have been placed in position, the caissons are installed and the protective embankment is completed, if necessary.

Because the plant is on floating platforms (and therefore mobile), it is necessary to decouple one point of the water discharge and intake system mechanically, ensuring, at the same time, proper hydraulic functioning of the system.

The condenser circulating water intake structure, provided with all the usual machinery and equipment, is arranged on one side of the platform (figure 2). The water is drawn from the basin by pumps (operating, therefore, under a constant head) and is channeled to the condenser, from where it flows off then through overflow pipes into a open-surface discharge tank joined to the mainland. From there, the water reaches the sea by means of a usual open-surface channel.

The pipes, anchored to the platform, go along with its oscillations and, therefore, move with regard to the walls of the discharge tank. This is the point of disengagement between the fixed part and the floating part.

An automatic sluice gate controls the level of the discharge tank, always keeping it above the level of the sea by a height equal to the loss of head in the discharge channel plus an adequate margin, in order to provide the requisite stability to the siphon on the output side of the condenser.

As has been indicated, there are two basic solutions for arranging the access channel:

a. Maintaining the channel by stabilizing the bottom appropriately. Seaward access to the channel is protected with a weir, leaving openings on the bottom of the channel so that only water coming from the bottom can enter.

b. Filling the access channel partially, leaving an open-surface channel, of an appropriate size for the required flow, so that the head losses will be sufficiently small. The first solution seems to be preferable, also in connection with the problem of dismantling the plant (and eventually its replacement with a new one) at the end of its period of useful life.

The results of a preliminary optimalization calculation of the cooling system are given in figure 3.

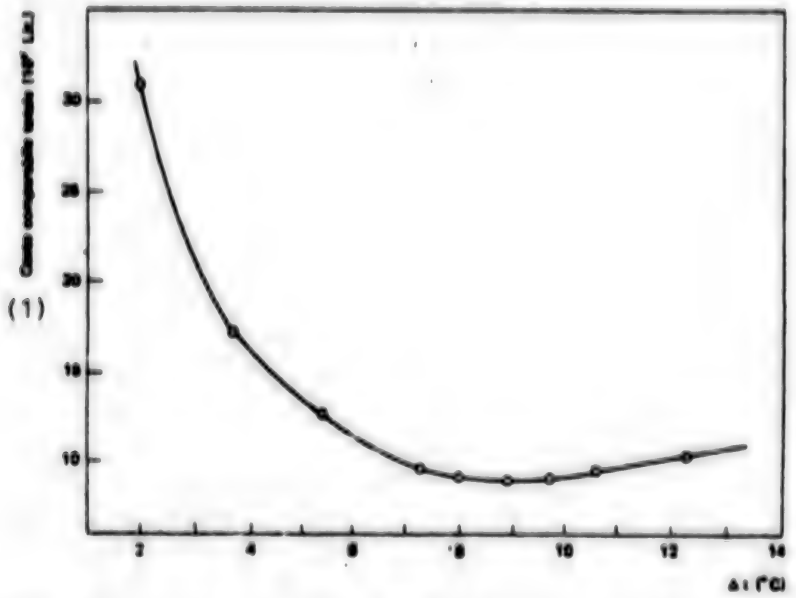

Fig. 3: Trend of cost of condenser circulating water system with relation to the rise in water temperature.
Key: 1. Total comparable cost (10^9 lire).

The especially flat part of the curve depends primarily on the configuration of the intake and discharge system. In fact, with traditional intake and discharge systems, involving long, large-diameter pipes, the curve has a more rapid trend and reaches its minimum at a greater ΔT (around 11°C). It is evident, from figure 3, that whenever it is desired subsequently to contain the thermal impact, it is possible to reduce the rise in temperature of the cooling water to 7°C, without an appreciable increase in cost.

In the already cited study (7), an area along the Italian coast has been singled out that, at first examination, seems suitable for installing an onshore plant.

The following are some of the main characteristics of the area examined:

Recently reclaimed marsh area.

Good seismotectonic characteristics (although this aspect is less important for plants on floating platforms in comparison with plants located on land).

Favorable demographic situation (figures 4 and 5), in which comparisons with other Italian sites already specified and with the average for European sites are shown.

Utilization of the territory compatible with the proposed installation (agriculture, livestock-raising and tourism little developed).

Conclusions

The basic characteristic that makes flotating nuclear plants particularly interesting is the separation between construction problems and problems of site qualification and approval. Construction can proceed independently of the location procedure, for example in a shipyard as has already been mentioned. When a decision is made, under the urgency of the moment, to start work on a site selected from previously studied sites, 10 to 12 months will suffice for completing excavations, preparing structures to house the platform and building the transformer substation (figure 6).

Nuclear tests can be started at the anchorage found, because nonnuclear tests will have been performed beforehand in the construction yard.

In conclusion, the plant can start production 14 months from the beginning of work on the site and go in operation at full power from 4 to 6 months later (figure 6).

We shall probably be asked why such an overall proposal is made in Italy and has not been made elsewhere. The following are the main reasons:

In view of Italy's geographic configuration, most of the powerplants will have to be built on coastal sites.

Both the electrical engineering industry and the nation's shipbuilding industry are in a precrisis situation owing to a lack of orders and both are capable of solving the technical problems pertaining to adoption of the indicated proposal.

Powerplants of the proposed type minimize the social-economic impact connected with their construction, an impact to which Italy gives considerable importance.

Italy is the only industrialized country in which various programs have been drawn up for the construction of powerplants for producing electricity, all mostly neglected in practice.

If, then, the general situation should evolve more favorably than anticipated, adoption of floating powerplants would still facilitate solution of the location problems.

In short, the results of the preliminary analysis of a technical solution that seems to offer sufficient advantage to justify the advisability of

more intensive study, both from the point of view of technical feasibility and of the economic expediency of the numerous problems pertaining to it.

It is recognized as advisable to examine, in the development of analysis, also the possibility of constructing the plant in parts, in order to make onshore installations feasible also on sites located on navigable rivers.

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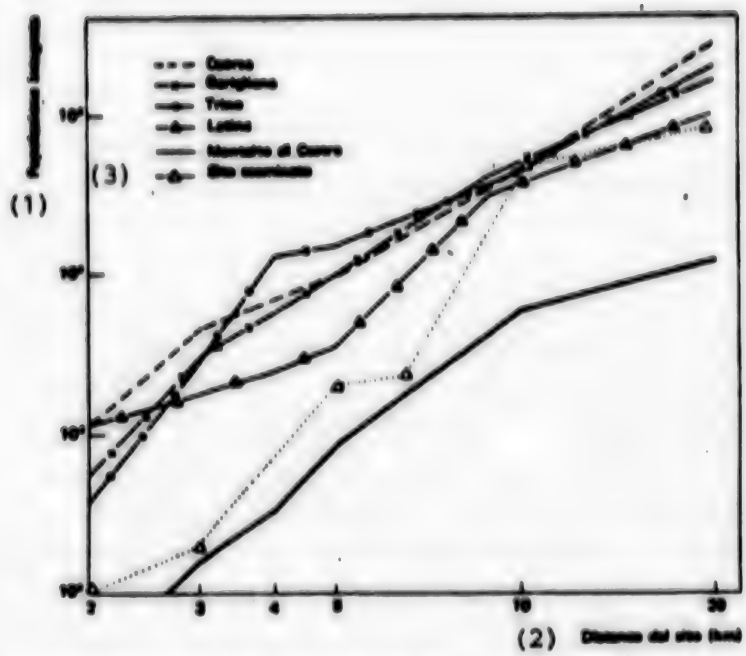
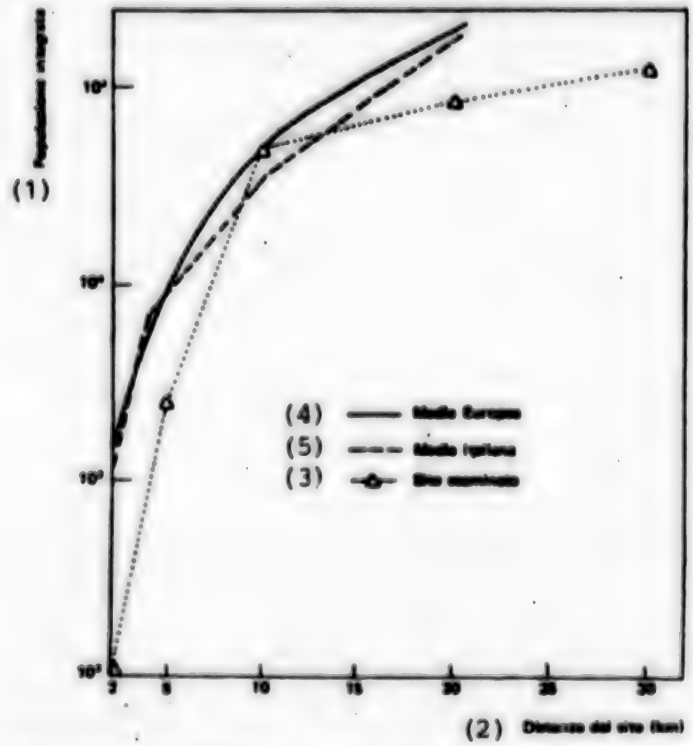


A. Comparison with sites of Italian nuclear electric powerplants.
Key: 1. integrated population; 2. distance from the site (kilometers); 3. site examined



B. Comparison with average European and Italian sites (excluding Montalto di Castro).
Key: 4. European average; 5. Italian average.
Fig. 4: Population distribution around site in terms of distance.

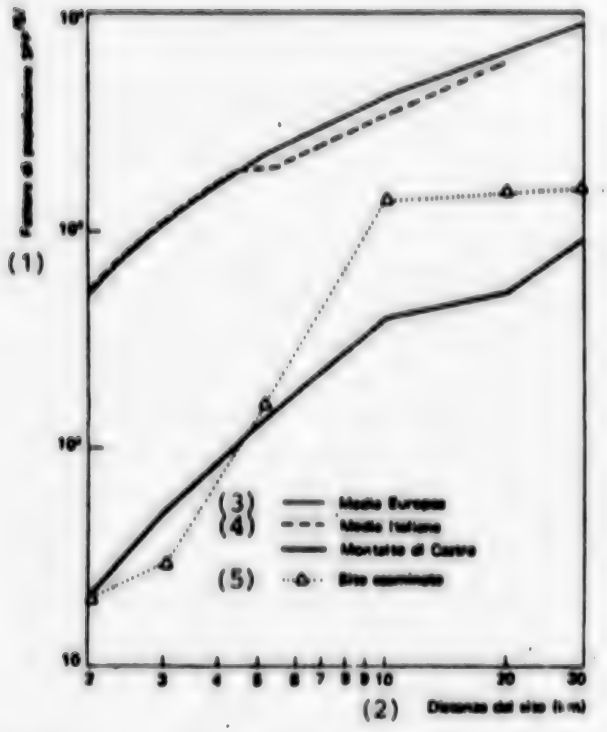


Fig. 5: Trend of the population factor in terms of distance, for various sites.
(1. population factor ("Site Population Factor" [8]; 2. distance from site (kilometers); 3. European average; 4. Italian average; 5. site examined.

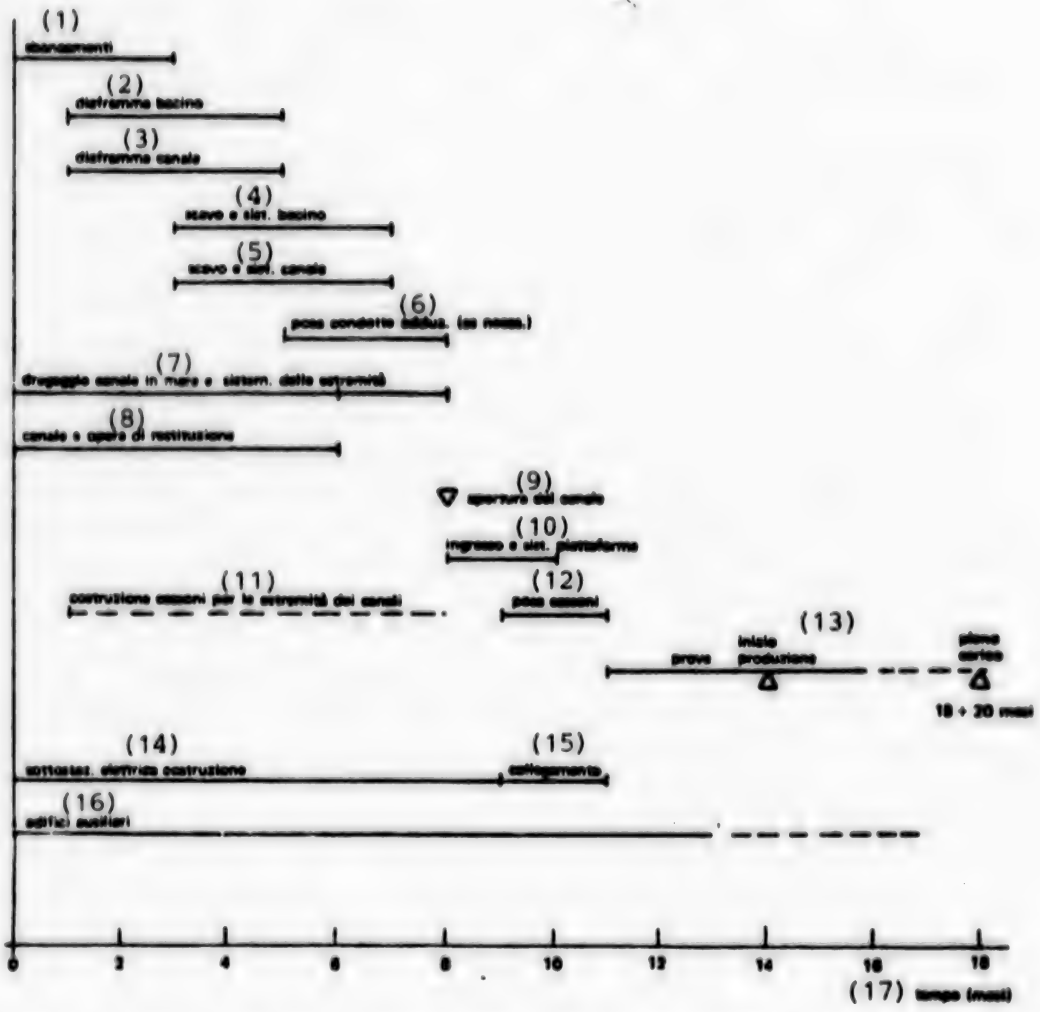


Fig. 6. Programs for execution of jobs required for site preparation, installation of the plant and its connection to the distribution network
Note: The program presupposes prior approval of the site and workup of estimate of the jobs indicated for the projects.
Key: 1. earthmoving; 2. basin diaphragm; 3. channel diaphragm; 4. excavation and basin system; 5. excavation and channel system; 6. laying supply conduits (if necessary); 7. dredging channel in sea and end systems; 8. channel and restoration jobs; 9. opening of channel; 10. entrance and platform system; 11. caisson construction for channel ends; 12. laying caissons; 13. tests, start of production, full load 18-20 months; 14. construction electric substation; 15. connection; 16. auxiliary buildings; 17. time (months).

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WEEKLY ASKS WHETHER SPAIN CAN MAKE NUCLEAR WEAPONS

Madrid BLANCO Y NEGRO in Spanish 5-11 Mar 80 pp 24-27

[Article by Henry A. Pryzbyl and Agustin Valladolid: "Spain: the Ghost of the Atom Bomb"; also includes statements by Antonio Sanchez Gijon, secretary of the International Issues Institute, and opinions of PSOE, PCE and AP party members]

[Text] When a newsman asked the minister of Defense about the possible existence of a project directed toward making the Spanish atom bomb, he received in reply a friendly little laugh, more like a fatherly scolding of an indiscreet child than an attempt to evade the question. The reaction of Rodriguez Sahagun was repeated a little later, although in a different way. UCD [Democratic Center Union] sources consulted by this periodical refused to answer our questions, alleging that "a very delicate matter was involved and the government's opinion might be confused with the party's opinion." At any rate, BLANCO Y NEGRO tried to learn from the mouth of experts on the topic the real possibilities in our country for construction of the atom bomb, as well as the political and economic repercussions and the truth of that strategic profitability and that international prestige that some say that it would provide.

In this connection, it would be necessary to begin by saying that, because Spain is not included in the Nuclear Weapons Nonproliferation Treaty, it does not have to submit to any rule of international law preventing it from making nuclear warfare equipment, with the exception of those rules stemming from bilateral agreements signed with the United States and the International Atomic Energy Agency (IAEA), which, by virtue of these agreements, control reprocessing of spent fuel in two of the Spanish nuclear powerplants, making sure that the resultant plutonium [is used] only for peaceful and commercial [purposes]. [Line dropped in source.]

This lack of independence in nuclear matters is based on a lack of technological resources of our own. Two of the three powerplants operating at present, Jose Cabrera (Guadalajara) and Santa Maria de Garona (Burgos),

were built with a 60-percent participation by the United States with regard to equipment and technical means, with Spain's contribution covering only the remaining 40 percent. Only the Vandellos 1 nuclear powerplant, in Tarragona Province, and consequently the uranium that it handles, is not subject to these commitments and safeguards and could tackle the project of making an atom bomb.

But first we must ask ourselves if we have sufficient means for carrying it out. In this respect, the French periodical LE POINT said recently that "there is a conviction in several Western capitals that Spain will probably be capable of making an atom bomb in 2 or three years from now." A little before this, the Soviet minister of Foreign Affairs, Andrey Gromyko, touched on the topic in similar terms in passing through the Federal Republic of Germany after his visit in Spain. BLANCO Y NEGRO has gathered the opinion of our experts.

The French "Example"

They confirmed that construction of an atom bomb is within the reach of a group of engineers and technicians with experience in the nuclear field, although they added that it is necessary to have, for that purpose, the requisite fissionable material produced in commercial nuclear powerplants (primarily plutonium). The highly radioactive fuel elements needed for making a bomb are extracted from this material. This process requires complicated facilities whose cost is very high.

In spite of all that, a high official on the Nuclear Energy Board (JEN) confirmed to us that "if the government made the necessary millions available to us, we could get underway."

The same source noted that we are being prevented from making an atom bomb not by technical difficulties, but, rather, by strategic, political and other kinds of difficulties. In addition to economic problems, of course. All the media consulted did not hesitate to describe the consequences of the expenditure involved in tackling the bomb construction project as "unbearable." "Making a bomb is one thing," the president of the Spanish Atomic Forum, Alfonso Alvarez de Miranda, remarked to us, "and having a nuclear weapon is something else." Alvarez de Miranda was referring to all those factors making a nuclear weapon operational and effective -- launching devices, transportation, and so on -- whose cost is much greater than the billions of dollars that an amateur's atom bomb would cost.

Nevertheless, in spite of the economic sacrifice that it would entail, in spite of the fact that "an atom bomb costs many millions and contributes nothing to the gross domestic product," as the high JEN official pointed out, in spite, finally, of the fact that Alfonso thinks that Spain's industry would absolutely not be benefited by its construction and is not interested in the matter, the Spanish atom bomb might give our country greater prestige, respect and independence in the world, as an offset. Or not?

Let us take a look at the example of France, which is very illustrative in this connection. The neighboring country is one of those that have, together with the USSR, the United States and China, what they call "atomic ingenuity." But that "ingenuity," which aside from an indeterminate number of bombs is supplemented with 39 Mirage-4 aircraft, five nuclear submarines and a land platform capable of achieving long-range launchings, has cost the French 20 years of research and billions of francs, in spite of which their nuclear war potential is several dozen times inferior to the United States or the Soviet Union, although they state bombastically, victims of an exaggerated chauvinism, that they could destroy 80 percent of the USSR with their means.

Prestige Against Independence

Then, where does the key to achieving greater prestige and independence internationally lie without a need for investing astronomical sums of money? "Believing that by having the atom bomb we are going to obtain greater respect in the world is ridiculous. Real independence consists in spending that huge sum of money for winning markets and for attaining a higher technological level," several specialists in the nuclear field pointed out to us. They expressed their confidence that, in this field, the plans provided for in the National Energy Plan (1978-1987), approved by the government, within which Spain has increased its participation to 66 percent in the nuclear powerplants now under construction, will be carried out. It will reach 80 percent in the plants that are in a prior authorization phase.

Our JEN source added that "this is the adequate nuclear policy: to obtain energy of our own without paying dollars abroad. At the same time, this economic independence will give us greater prestige and the possibility of having access to foreign markets, especially South America. In short, I shall tell you that making an atom bomb is technically possible, if there is the requisite budget providing adequate technical means. But, in Spain's case, the project is stupid. It is incredibly vain to try to join the nuclear club without taking into account the fact that the great powers have thousands of bombs that would make our attempt a mere absurdity."

Sanchez Gijon: "It Would Be Gravely Irresponsible To Make It"

"I believe that the topic of the atom bomb is being used like holy water for the problem of defense. But the truth is that it would be a gravely irresponsible decision and economically stupid. Not so much because of the nuclear weapon, but, rather, because of the factors needed for its transportation and launching: missiles, aircraft or submarines," Antonio Sanchez Gijon, secretary of the International Issues Institute, member of the International Institute for Strategic Studies and author of books, like "El camino hacia Europa" [The Road to Europe], "Europa, tarea inacabada" [Europe, an Unfinished Task] and "Espana en la OTAN" [Spain in NATO], told BLANCO Y NEGRO. "Generally, the factors entering into the world's strategic balance are unknown," he went on to say. "What a nuclear weapon

must seek is a convincing deterrent capability. That is to say, its possible utilization must be credible. I do not believe that Spain is in a position to equip itself with a nuclear weapon and convince a potential enemy that it can do him considerable damage."

Distorted Nuclear Balance

In the opinion of Sanchez Gijon, the possible possession of an atom bomb by our country would not entail the desired deterrent effect, but, rather, would be "a nuclear balance distorting factor." He added that, "in case Spain had it, it would feel that it is lined up within a system in which this issue has been settled in two ways: those who do not have it and who are incorporated in a system of defense structured and organized around support by the United States, and those who have it and are not incorporated in this mechanism, making their weapon able to produce the above-mentioned deterrent effect, owing to its complexity and quality, although not to its size."

According to the specialist, Spain not only should have a nuclear weapon, but also a high level in every kind of armament, which it does not have. "Spain should take its logical position with regard to conventional weapons by becoming incorporated in one of the nuclear mechanisms of the great powers. Thus, its participation can be effective at every level of deterrence." Sanchez Gijon advocates an improvement in quality in the field of conventional weapons, because Spain would have no choice in a nuclear confrontation. "Besides, I do not believe that the United States would support the decision to make an atom bomb," he concluded.

Opinion of the Parties: UCD Abstains

Owing to the far-reaching importance of the topic, BLANCO Y NEGRO contacted the majority political parties to ask their opinion on the subject. UCD, PSOE [Spanish Socialist Workers Party], PCE and AP [Popular Alliance] received the questionnaire. Nevertheless, and in spite of our repeated urging, UCD rejected the invitation to show its opinion. The following were the questions submitted:

1. What would be the political significance of Spain's having the atom bomb?

2. Party's stand with regard to its possible production in our country.

Enrique Mugica (PSOE): "A Gesture Rather Than a Reality"

1. Apparently, it would be a gesture of independence, but actually the attitude would consist of more appearance than reality, because that weapon would merely have the value of a prototype or, at best, the power of the units that we could make would be ridiculous in the face of the arsenal of the powers that already have it.

2. It is a luxury that we cannot allow ourselves. We have limited public resources and what we have are insufficient to take care of the requirements of the battle against unemployment and investment.

Analyzed from the military point of view, if we had greater capabilities, we should use them to improve our conventional armament, which is inadequate.

Jose Luis Buhigas (PCE): "Solutions of the French Type Make No Sense in Spain"

1 and 2. In principle, the party's philosophy is absolutely opposed to the military use of nuclear weapons, agreeing exclusively to use of the atom for peaceful purposes. Nevertheless, the constant technological progress that has resulted in a reduction of the critical mass in nuclear devices to figures not in excess of 5 kilograms, or even less, making it possible to launch them with 150-millimeter artillery, makes it necessary, at least, to raise the issue again seriously.

My personal opinion is that going for solutions of the French striking force type makes no sense for Spain from any point of view, because, aside from their astronomical cost, their very doctrinal validity is seriously questionable.

Nevertheless, the fact that the technological process facilitates access to it by moderately developed countries raises the possibility that other countries in our geographic area, with which conflicts of interest may come up, may decide on that solution. This could entail de facto situations of blackmail of our country. Under those conditions, it would be difficult to deny our Armed Forces access to a tactical nuclear weapon, so that they may be able to comply with the constitutional mandate of guaranteeing Spain's sovereignty and independence.

Guillermo Kirkpatrick (AP): "We Must Be Realistic"

1 and 2. It is necessary to be realistic in international politics. It serves no purpose to engage in futurology or to speculate on what might be if we had an atom bomb, when we actually have none.

Spain is in no position, at present, to protect its security with its own nuclear force that might serve as a factor of deterrence, if we are involved in a conflict.

What doubt is there that a greater degree of independence could be achieved by having our own nuclear weapons, but, at the present time, we are very far from France's capabilities, for example? This does not mean, far from it, that we are going to have a position of dependency on other countries because we lack an atom bomb. We shall have dependency or independence depending on the way in which are able to negotiate our position in

the world. The international situation is becoming constantly more complicated, so that it may be stated without fear of being wrong that, at present, there is no room for going it alone and that it is becoming more and more dangerous to play the game recklessly of not being completely well accompanied. I mean by this that a Third-World policy is not possible for Spain and that our country's nonalinement proves to be utopian.

Popular Alliance is in favor of urgently putting in practice all the means required for an effective defense of the nation's territory and, in this connection, what doubt is there that the nuclear umbrella is the sole effective guarantee of detente?

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